

# Growing WILD

Fall 2002/Winter 2003

Utah's Project WILD Newsletter



## Utah's Super Snakes!

*"You limbless, slithering, scaly-skinned, fork-tongued, cold-blooded, glaring-eyed, flesh-eating reptile!"* — sounds more like something you'd hear at the

showdown in a bad western than a simple description of a snake. Snakes belong to the scientific suborder Serpentes, a name derived from the Latin stem *serpens* which means to creep or crawl.

One of the world's most successful groups of animals, snakes truly display a wealth of different, yet fascinating, features.

Most obviously, snakes lack limbs. But besides, drawing a gun, having no limbs hasn't kept snakes from doing much, including climbing, digging, swimming and moving fast across the ground. Vestigial hind limbs, found only in a few primitive families, offer evidence of snake's decent from lizards. Snakes are the most recently evolved of all reptiles and have existed on Earth for about 125 million years. They are thought to have evolved from ground dwelling and burrowing lizards that exploited the survival advantages offered by a cylindrical, legless body.

Movement in snakes is mainly accomplished by muscular control of the enlarged ventral scales or *scutes* that cover the belly. Each scute is attached to two or more pairs of ribs by muscles that allow it to be tilted in or out and to be pulled back and forth. The scutes act like a set of contact points similar to the tread of a tank. With rhythmic contractions of the muscles, a snake can "get a grip" with its scutes and dig in against the contact points to pull itself along. In *rectilinear* movement, by moving its ventral scutes in groups with some pushing back against the ground while others slide forward, a snake can move slowly over the ground in a straight line. To move quicker, a lateral, or *serpentine* motion, the most common mode of movement used by snakes, is employed. In serpentine motion, the body of the snake, laid out in a series of S-shaped curves, slides forward while the head lays out additional curves. The hind part of each curve is pushed sideways against small irregularities on the ground such as rocks and sticks allowing the snake to maneuver itself along in a continuous undulatory motion. Muscular movement of the ventral scutes provides additional traction. Serpentine motion is also used by swimming snakes.

*Concertina* motion is a specialized type of motion used especially by many tree-dwelling snakes that have a prehensile tail. In this motion, the snake first bunches itself together from side to side. Then, using its tail as an anchor, the snake lifts and stretches the front part of its body forward or upward. Finally, it anchors the front part of its body and pulls the tail along. *Sidewinding*, a fourth way of moving, allows some snakes to move across loose sand without sinking. In this movement, the snake first lifts its head and throws the fore part of its body forward and sideways in an arc. As the front touches the sand, the snake transfers the rest of its body across that arc. Even before the tail end touches the sand, the snake has already laid out another arc with its head. While sidewinding, only two short portions of the snake's body touch the sand at any time, keeping much of the snake's body off the surface of the sand, which may be dangerously hot. Sidewinding produces a series of J-shaped tracks in the sand.

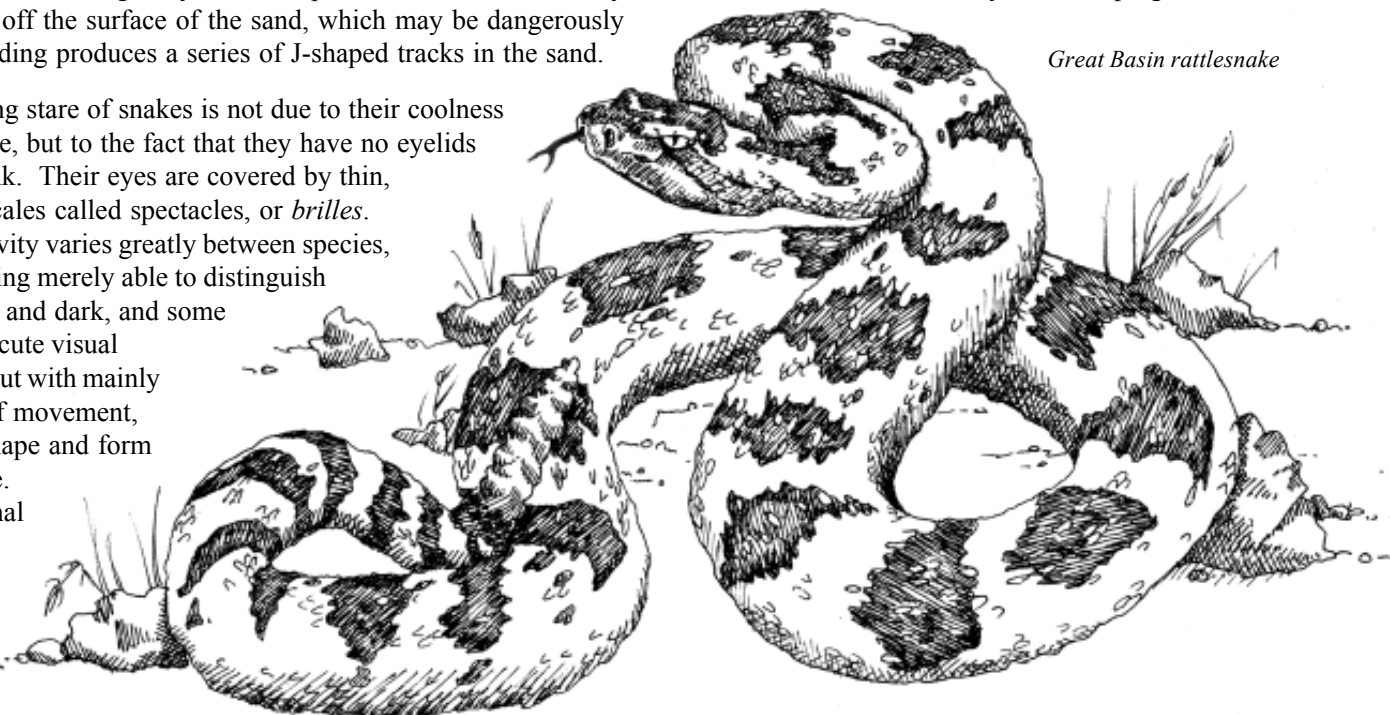
Great Basin rattlesnake

The unblinking stare of snakes is not due to their coolness under pressure, but to the fact that they have no eyelids and can't blink. Their eyes are covered by thin, transparent scales called spectacles, or *brilles*.

Visual sensitivity varies greatly between species, with some being merely able to distinguish between light and dark, and some having very acute visual capabilities, but with mainly recognition of movement, rather than shape and form at short range.

Some nocturnal species have eyes with

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vertically elliptical pupils that open very wide in dim light. Snakes do not have outer ears either. This doesn't mean they can't hear. They just hear differently, detecting vibrations transmitted through the ground by way of the jawbone to reach their inner ears. The insides of their bodies are quite different as well. Because of their long, slender shape, snakes have evolved an unusual arrangement of organs.

For instance, instead of coiled intestines snakes have a straight canal that passes from the mouth to the vent with only a single loop in the small intestine. The liver has only one lobe, the kidneys are found one behind the other, and the only lung that most snakes have extends more than half the length of the body.

The forked tongues of snakes aren't used for spreading lies, but instead for "smelling" the air by picking up tiny odor molecules and transferring them to a highly sensitive chemical receptor, the Jacobson's organ, located in the roof of their mouth. This organ analyzes chemical signals and allows snakes to track prey, recognize predators or find mates. Fitting through small grooves in its upper lip, a snake's tongue can be flicked in and out continuously without opening the mouth. Having a "forked" tongue lets the snake "smell" in stereo, allowing it to more accurately pinpoint sources of chemical signals. The pits of a snake's Jacobson's organ were first observed by a Dutch embalmer named Frederick Ruysch in 1703. He noticed a tiny pit on either side of the human nasal septum as well. His findings were ignored until 1811 when Ludwig Levin Jacobson, a Danish surgeon officially described what today is known as the vomeronasal organ or Jacobson's organ. Common to many vertebrates, the Jacobson's organ is best developed in snakes and certain lizards. In mammals, including humans, the organ's function is not certain. Some scientists consider it vestigial. Others believe it to be a functional pheromone receptor.

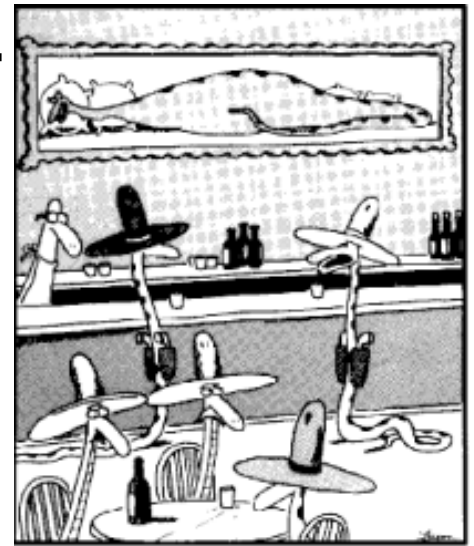
Some snakes, including pit vipers, pythons and some boas, have a set of sensory organs able to detect infrared heat rays. These heat receptors are within the small "pits" found between the eyes and nostrils of pit vipers (including rattlesnakes) and along the lips of pythons. The most sensitive heat receptors known in the animal world, they allow a snake not only distinguish direction of an object that differs in temperature from the background, but also its distance, by being able to sense differences of less than 0.002 °F. The snake's brain forms a thermal picture giving it the ability to find and strike a mouse with deadly accuracy even in total darkness.

Their scaly skin isn't a condition caused by the dry, dusty range or too much sun. Just the opposite, a snake's scaly skin, made of keratin, protects it from the elements and injury. The scales on the back are small and overlap each other like shingles on a roof. On the belly, they are long and narrow and extend across from side to side. They are also smooth and glossy to reduce friction as the snake moves along the ground. Below the tail, the scales usually form two rows. Periodically shedding the outer layer of its skin (a process called *ecdysis*) allows a snake to grow and renew the protective qualities of its outer garment. Beginning at the corner of the lips, the snake simply crawls out of its skin, turning it inside out as it comes off, usually in one piece. Snakes often use rocks and brush to snag the skin and hold it during the process. Most shed their skin several times during a single year, revealing a renewed shiny covering. Different colors and patterns may offer camouflage to snakes or sometimes warn predators to stay away.

Carnivores indeed they are, and considering they have no arms, legs, wings or talons, it's amazing the diversity of strategies snakes employ in catching and killing their prey. Rattlesnakes lay in wait to strike and inject immobilizing venom into their prey. Racers speedily race after and use their jaws to grab onto small animals unable to get away. Hognose snakes dig through the sand with shovel-like snouts to ferret out toads and lizards. And constrictors wind squeezing and suffocating coils around their captives to subdue their meal.

Mammals and birds are the favored prey of many snakes. Others have more exotic tastes, preferring frogs, fish, snails, slugs, worms, eggs, insects or even other snakes. Although sometimes seeming impossible, snakes can devour prey substantially larger in diameter than their heads. Their lower jawbones, attached to the skull only by muscles and ligaments, are able to swivel freely, allowing each bone to move independently up and down, back and forth, or from side to side. The *symphysis* or apex of the lower jaw can also be disjointed. This mobility, combined with very elastic tissues of the mouth and throat, give snakes the ability to engulf their prey whole without any difficulty. Backward-pointing curved teeth inside the mouth also help secure and direct the meal towards the gullet. To continue breathing while swallowing a snake can extend its windpipe forward beyond the body of its prey allowing the snake to inhale and exhale with ease.

Calling snakes cold-blooded is merely a reference to their thermodynamics rather than their disposition. Snakes are ectothermic (literally "outside heating") meaning they are unable to regulate their body temperature from within, keeping it at a constant



"Who are we kidding, Luke? We know this is going to be just another standoff."

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level as do mammals and birds. Thus, they must rely on the outside environment to regulate their temperature. Being cold-blooded has influenced the world's distribution of snakes. Of the approximately 2,700 species of snakes in the world, most are found in the tropics. A few live in cool temperate areas, but none exist in the polar regions. Utah's unique geography and geology create a wide variety of environments to which snakes have adapted. Some have found suitable habitat within our high mountain ranges, and others have adapted to life in the desert valleys or canyons, especially on the valley floors and in the scrub forests of the foothills. A few species occur widely and are able to survive in most of the state's habitat types. Others have very limited distributions within the state, being restricted solely to the small region of the Mojave Desert reaching into Washington County.

Approximately 33 species and subspecies of snakes are found in Utah. The number is "approximate" in that there is considerable debate among herpetologists regarding specific classification of various snakes. The number tends to depend upon "who you are talking to." When reading up on a particular snake, one will often encounter a number of different scientific names and common names. Ongoing research and better technology, especially in the field of genetics, keeps providing more information, understanding of species relationships and taxonomic revisions.

Most of Utah's snake species belong to the family Colubridae, the largest family of snakes by far with over 2,000 species worldwide. The Colubrid snakes are sometimes referred to as "typical snakes." Rattlesnakes, which belong to the family Viperidae, the pit vipers, comprise most of the rest of the state's snake species. Within their individual ranges, most species seek out warm places such as rocks and paved roads to bask in the sun and raise their body temperature, moving into the shade or seeking shelter in a small mammal burrow or under a rock when the sun is too strong. Some are nocturnal to avoid extreme daytime temperatures. Dropping temperatures in fall trigger them to retreat to hibernation dens, usually a rocky area or crevice where they can get into the ground below the frost line. Here they congregate, often in mixed species groups generally in Utah from October through March.

Denning not only protects snakes from cold temperatures, but provides snakes an opportunity to come in contact with other snakes of the same species. As they emerge from their dens in spring, they often begin seeking a mate. After courtship and mating, most snakes lay white or creamy-colored leathery-shelled eggs in a nest. Egg-laying snakes are termed *oviparous*. Hatching snakes have a sharp egg tooth on top of their snout to help them cut through the leathery egg shell. *Ovoviparous* snakes instead bear live young, most just retaining their eggs within a shell inside their body until the young are born. Some snakes go even further and develop a simple placenta linking the embryos with the mother. Most snakes exhibit no parental care at all. The young are so well developed at birth or when they emerge from their egg they are more than able to fend for themselves.

Fifteen of the snake species found in Utah are currently included in the *Utah Sensitive Species List*. The greatest threat to populations is loss of habitat. This has been a serious factor impacting populations of at least half of the 15 sensitive species, the ranges of which, fall within the small portion of the Mojave Desert in Washington County. Rampant development in this area has literally eliminated a significant amount of habitat.

Poaching has become a factor impacting populations of snakes as well. Although there are specific regulations governing collection, importation and possession of reptiles, illegal trade of wildlife is relatively widespread. Most snakes which are illegally collected are sold or traded to other reptile collectors. Some colorful snake species such as the "tri-colored" milk snakes and kingsnakes are especially desirable and potentially vulnerable to population declines. Where there are species that come in a variety of color gradations and patterns or certain specific areas, some avid collectors even attempt to get one of each variety or one from each locality. Various rattlesnakes such as the midget-faded rattlesnake which can bring in hundreds of dollars are also especially coveted.

Poachers tend to drive roads at night in the spring when young snakes emerge and are active as the weather starts to warm up. Taking reptiles from the wild in order to sell them is against the law in Utah. Regulations are inconsistent between states and for species, and Federal laws regulating interstate transportation of reptiles are lacking (except for Federally listed Threatened or Endangered species). So once a poached snake has been successfully transported out of the state, prosecution of a poacher becomes very difficult. Persons who have information regarding the illegal collection or sale of snakes are encouraged to make a call to the Division of Wildlife's "Help Stop Poaching" hotline at (800) 662-3337. In Utah it is also illegal for a person disturb a den, or to harass, kill or capture any reptile within 100 yards of a den.

Utah's snakes are a unique and important component of ecosystems. Generally solitary and secretive, predicting when or where you will see one is certainly difficult, making a chance meeting an unexpected surprise. Keep a watch for them in the fields, hills, deserts and canyons the next time you're out and about. If you see one, try to refrain from calling the snake a bunch of nasty names.

# Utah Snakes!!

## Blind Snake – *Leptotyphlops humilis*

At first glance, a blind snake might resemble a worm more than a snake. Tiny, slim snakes, one can be described as nothing more than a neck-less, blunt head on a slender cylindrical body ending in a short, rounded tail bearing a tiny spur on its tip. Rarely measuring more than 10 inches long and no wider than a shoelace, they are purplish, brown-gray or pink above and lighter below. A closer look in good light reveals a silvery sheen of smooth, tightly overlapping, hexagonal-shaped scales. Tiny vestigial eyes appearing as dark spots below ocular scales serve merely to perceive light.

Blind snakes belong to a family of snakes called the Leptotyphlopidae, or slender blind snakes. Matching their description, the scientific name of blind snakes comes directly from the Greek words *leptos*, meaning slender, *tuphlos*, meaning blind, and *ops*, meaning eye. In common vernacular, they are also called thread snakes or worm snakes. The Latin word *humilis* means small or ground-dwelling and reflects the subterranean lifestyle of these snakes. Blind snakes burrow underground among roots and beneath rocks, sometimes jabbing the spur on their tail into tunnel walls for leverage while moving through the soil. Their skulls are also more solidly fused than those of most other snakes to help them push through soil. Seldom seen because they are fossorial and nocturnal, people sometimes encounter blind snakes while excavating foundations, digging ditches or post holes, or gardening. Sometimes they are also brought home as a gift by the family cat. Although they spend much of their lives underground, they also roam the surface at night or around dusk during the summer months, especially after rainstorms.

Considered among the most primitive of snakes, slender blind snakes retain tiny remnants of pelvic bones embedded in their muscles as well as rudimentary femur bones. They have teeth only in their lower jaw and the scales on their underside are not elongated, but are the same shape and size as the rest of their scales. They retain so many primitive features that some herpetologists have suggested they be reclassified into their own group separate from other snakes. Though considered primitive, they also exhibit many specializations and a relatively high degree of diversification among species.

The subspecies unique to Utah, the western blind snake (*L. h. utahensis*) was officially described by Vasco M. Tanner in 1938. This subspecies ranges from west Texas to extreme southwestern Utah. Restricted to the Mojave Desert portions of Washington County in Utah, they occur in a variety of brush-covered habitats at elevations between 2,500 and 4,000 feet. Here they frequent rocky hillsides with patches of loose, moist soil suitable for burrowing and canyon washes near streams.

Blind snakes feed upon soft-bodied insects, especially ants and termites and their eggs and larvae. They locate colonies of ants and termites by following pheromone trails left by these insects. To fend off biting ants, blind snakes can tilt and angle individual scales to make it harder for ants to get a grip with their jaws. Foul smelling secretions from cloacal scent glands found in blind snakes aid in repelling attacking ants as well. Their cloacal discharge may serve to deter predators as well. When captured, a blind snake will writhe wildly, poke with its spur and discharge the contents of its glands. Though harmless, the odor and spur may startle a predator and allow the snake to make an escape.

Blind snakes mate in spring. In late summer the females lay 2 to 6 slender, tiny  $\frac{5}{8}$  inch long eggs in protected underground nurseries. Sometimes they nest communally. The eggs are tended until after the  $3\frac{1}{2}$  inch long hatchlings emerge from their eggs.

Despite what is known about these truly unique snakes, other aspects of their life history, including details of their annual activity cycles, longevity, limits of their ranges and evolutionary history, remain an enigma. If you ever see one of these, tiny creatures, now you'll know it's a blind snake and not an earthworm.



blind snake

## Rubber Boa – *Charina bottae*

Rubber boas aren't made of rubber like the fake snakes people use to scare their friends. They're called rubber boas though because their smooth scales and loose skin make them look and feel like soft rubber. Rubber boas are uniformly chocolate-brown to olive green or grayish-tan in color above and yellow to cream colored below. They are stout-bodied snakes with no noticeable neck and a short blunt, rounded tail. Their eyes are small with vertical slits.

Rubber boas belong to a large family of snakes, the Boidae, which includes all five of the world's largest snakes, including the giant pythons and enormous anacondas. Boids are an ancient family characterized by a mixture of modern and primitive traits. They have flexible jaws found in more advanced families, but also retain a pelvic girdle, vestigial hind limbs, and many use both lungs. The vestigial appendages are visible on the exterior of the snake as tiny spurs (most evident in adult males) and have muscle attachments for movement. While there are close to a hundred species of boids worldwide, the rubber boa is one of the only two boas found in North America. Both of North America's boas belong to the sub-family Eryciniae, or sand boas.

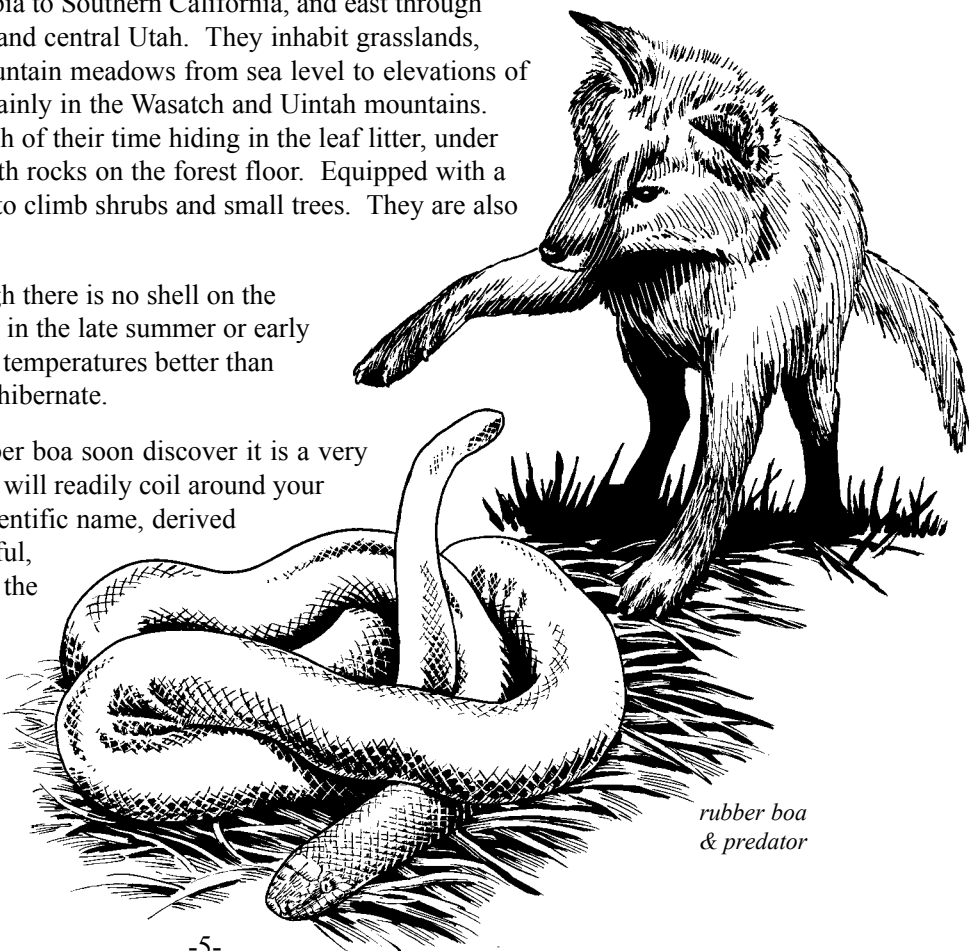
Although rubber boas are related to the 20+-foot long boas and anacondas that live in the rainforests of Central and South America, they seldom exceed 2 feet in length. They do, however, use the same constricting method to capture prey, first grabbing the animals with a bite, then wrapping powerful coils around it until the intended meal suffocates or its heart stops beating. Although anacondas have been known to eat goats and other large beasts, rubber boas stick to mice, shrews, amphibians, lizards, snakes and small birds.

When disturbed, a rubber boa coils up and buries its head within its body coils for protection, leaving its stumpy, club-like tail sticking out as a decoy for its head. Sometimes it even wiggles its exposed tail making false "strikes" with the tail to ward off danger. Many rubber boas bear scars on their tails, providing testimony to their having used them to shield their heads, perhaps from protective female rodents when hunting for baby mice, or possibly to deflect attacks from predators such as ravens, raccoons and skunks. This use of the tail to mimic the shape and behavior of their head has earned rubber boas their nickname, "two-headed snake."

Ranging the farthest north of any species of boa, rubber boas are found along the west coast of North America from southern British Columbia to Southern California, and east through northern Nevada, Idaho, Montana and north and central Utah. They inhabit grasslands, damp woodlands, coniferous forests and mountain meadows from sea level to elevations of 9,200 feet. In Utah rubber boas are found mainly in the Wasatch and Uintah mountains. Secretive and not often seen, they spend much of their time hiding in the leaf litter, under rotting logs, within rodent tunnels and beneath rocks on the forest floor. Equipped with a prehensile tail, they are adept climbers, able to climb shrubs and small trees. They are also good swimmers.

Rubber boas give birth to live young, although there is no shell on the retained eggs. Usually 2 to 8 young are born in the late summer or early fall. Although they are able to endure cooler temperatures better than most snakes, during the winter months they hibernate.

Hikers and campers who come across a rubber boa soon discover it is a very docile, pleasant snake. When picked up they will readily coil around your wrist. *Charina*, the generic portion of its scientific name, derived from the Greek term *charieis* meaning graceful, reflects this. The species name comes from the rubber boa's discoverer, Paulo Emilio Botta, the 19<sup>th</sup> century explorer who first collected this snake. Because of their gentle nature, rubber boas are popular as pets. This popularity though poses a threat to rubber boas when they are taken illegally from the wild. If you find one, enjoy it for a while, but be sure to return it to its natural home.



rubber boa  
& predator

### Smooth Green Snake – *Liochlorophis vernalis*

As suggested by its name, the scales of the scales of this snake are smooth—they lack keels—and the snake is green in color. The smooth green snake is indeed green, more specifically, a solid bright grass-green color above. Its underside is white, often tinged with pale yellow. Recently hatched young however, are a bluish-gray or dark-olive green.

Being green in color, the ideal and actual preferred habitat of this snake is moist, grassy areas in meadows, marshes and in fields along forest edges. A common local name for this snake is “grass snake” since they are almost exactly the same color as fresh green grass.

The smooth green snake is a small to medium sleek, streamlined species measuring from 15 to 30 inches in length. Swift and well adapted to hiding in its environment, this snake, like magic, is so efficient at disappearing that very few people ever get more than a glimpse. Aside from protective coloring and speed they have no defense against harm. If caught, they tend to be quite docile. Even if they do try to bite, their jaws are too small to inflict any damage. They usually just wrap their delicate tail around the fingers of their captor and wait to be released.

The smooth green snake is patchily distributed throughout the northeastern and western United States, southeastern Canada and parts of Texas and Mexico. In Utah, they can be found in the Wasatch, Uinta, Abajo and La Sal mountains and the East Tavaputs Plateau at elevations up to 9,500 feet. Usually they hide under rocks or other naturally occurring litter at the margins of forest streams and meadows. Sometimes they can be seen sunning themselves on low branches of trees or shrubs where it forages. Insects and spiders make up the bulk of their diet.

In winter smooth green snakes hibernate, often together, in small mammal burrows or other underground shelters. In spring and early summer they mate. Females lay between 3 and 11 cylindrical, thin-shelled eggs within decomposing logs or mounds of dead vegetation. The 4 to 6 inch long young snakes emerge from their eggs in about 4 to 23 days. They begin foraging for food shortly after the skin is shed for the first time.

In Utah, smooth green snakes are not common, and due to their limited numbers and distribution, they have been included on the *Utah Sensitive Species List*. If you perchance happen upon one of these quick escape artists, maybe you’ll be lucky enough to get a good look before it streaks off into the tall green grass.

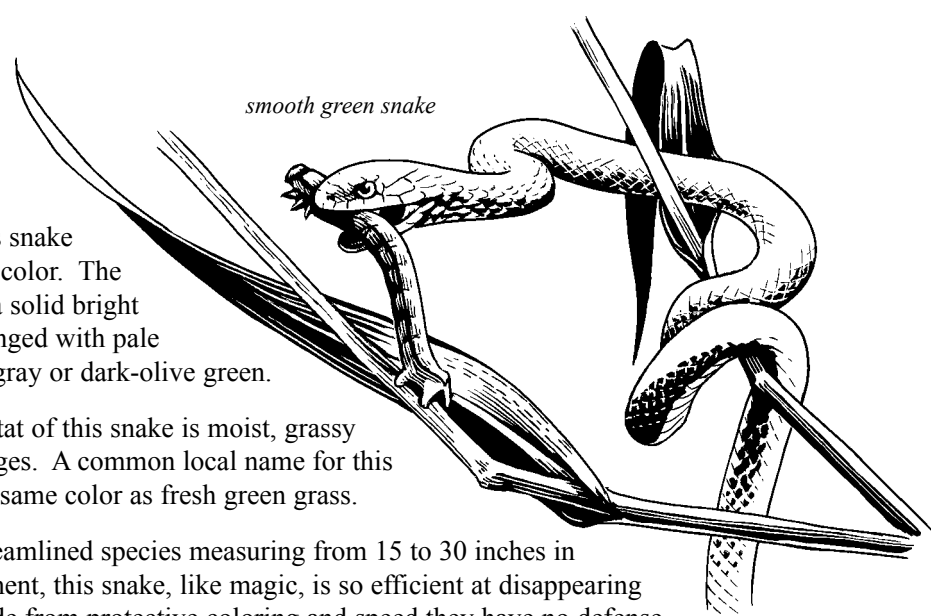
### Rattlesnakes – *Crotalus* spp.

Rattlesnakes get their name from the rattle at the end of their tail, a feature that distinguishes them from all other snakes. This rattle consists of modified, epidermal scutes—dry, hollow, loosely overlapping segments composed of keratin, the same material that makes up our fingernails. A rattlesnake’s rattle is built like a stack of tiny, interlocking cup-like structures. When the snake shakes its tail, the segments bump against each other like miniature castanets creating a buzzing sound like the sound of grease sizzling in a pan. The intensity of the sound produced results from specialized tail-shaker muscles vibrating the segments at a rate of about 55 cycles per second.

At birth, newborn rattlesnakes don’t yet have their rattle. When born, they have only a small, rounded nub at the tip of their tail called a “prebutton.” Upon shedding a few days later, the young rattlesnakes lose their prebutton, replacing it with the first segment of their rattle called the button. It takes a few more months, and another shedding with the addition of a second segment, before the young rattler can generate a soft rattle. Thereafter, throughout its life, the rattlesnake adds a rattle segment with each shedding. As the rattle grows, so does the loudness of the rattle.

Some people believe one can tell the age of a rattlesnake by counting the number of rattle segments in its rattle. This rattlesnake “tale” happens to be false since rattlesnakes can shed their skin anywhere from 1 to 4 or more times a year. Factors such as stress, wear and tear on the skin, and growth, which correlates with food availability, all affect the frequency of shedding. In addition, rattles are relatively fragile and segments break off easily over time.

A number of theories regarding the development of rattles have been proposed. One suggests the rattle originally developed as a device to lure prey. Perhaps lying still, a wiggle of the tail tip could draw a frog, lizard or mouse, mistaking it for a tasty worm, to venture within striking distance. “Caudal luring,” using the tail to attract prey is well documented in some more primitive rattlesnake species, as well as newborns of several more advanced rattlesnakes.



smooth green snake

Later, as rattlesnakes developed in the more open country, it is thought the rattle may have evolved into more of a warning devise that helped snakes avoid being accidentally trampled by hooved animals. This idea is thought to have inspired the images of rattlesnakes and the motto, “Don’t Tread on Me” seen on early flags of the American Revolution. Potential predators also learned to avoid the sound—so well that some animals, such as burrowing owls, developed a defensive hiss that sounds surprisingly similar to a rattlesnake’s rattle. Regardless of how it developed, the snakes use of the rattle is generally understood to mean, “I’m over here and you probably don’t want to come much closer.”

About 33 species of rattlesnakes range from southern Canada to southern South America. Concentrated in the south-west, about fifteen species occur in the contiguous United States. In addition to their trademark rattle, rattlesnakes are renown for their highly evolved venom and fang system. When not in use, the fangs of rattlesnakes are folded back against the roof their mouth. Similar to a hypodermic needle, each fang is a slightly curved, hollow, sharply pointed tooth with a small opening on the side instead of at the tip to prevent clogging when puncturing flesh. Venom, in essence highly modified saliva, is made and stored inside a special gland inside the snake’s head. Upon striking, it is squeezed by muscular action into the fang and injected through the hole near the tip.

Fangs wear out over time and are periodically replaced. To ensure the snake is never without fangs, a series of replacement fangs in progressive stages of development are hidden behind each maxillary bone. On each side of the upper jaw there are also two fang sockets that alternate as bases for active fangs. Before a worn fang is lost, a new fang swings into the empty socket beside the fang to be discarded and establishes a connection with the duct of the venom gland.

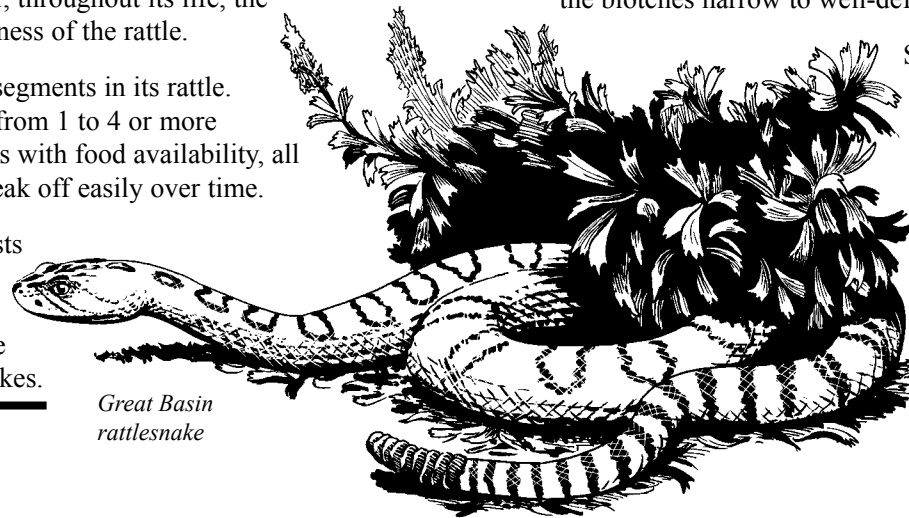
Rattlesnakes primarily use their venom in an offensive manner—to capture prey. The defensive use of venom is considered secondary to this main function. Research has shown that rattlesnakes are very frugal with their venom and can judge the amount needed to subdue prey of a certain sizes. Venom not only kills prey but also begins the digestive process by breaking down the tissue of the victim. Extremely complex, it consists of combinations of proteins that range from hemotoxins, which break down cells and tissues, to anticoagulants and neurotoxins that may cause circulatory arrest or respiratory paralysis.

To capture prey, rattlesnakes often employ the strategy of lying in wait until an unsuspecting meal wanders within striking distance. Rodents, such as mice, rats and ground squirrels are favored prey, though birds, lizards and amphibians are taken as well. With its head elevated and neck pulled back in an “s,” the snake lunges its head forward at a speed of about 10 feet per second, puncturing its target with sharp extended fangs. Once a strike is made, the snake lets go. The envenomated victim appears to get away, but doesn’t make it far. Once the prey is safely dead, the snake uses its tongue and heat-sensitive pits to track it down. It’s interesting to note that when a snake strikes a bird, it doesn’t let go. A bird could possibly fly off too far before dying, making it difficult for the snake to find.

The danger to people presented by rattlesnakes is greatly exaggerated. People rarely die as a result of a rattlesnake bite. Most rattlesnakes have relatively weak venoms compared to the toxicity of venoms from other snakes such as true vipers and cobras. When coming upon a person, a rattlesnake will usually make every effort to retreat. If cornered it may coil and rattle its tail as a warning. They are well aware that confronting a threat the size of a human is dangerous and striking in defense is usually a last resort.

In addition to their rattle, fangs and pits, all rattlesnakes have a triangular-shaped head covered with many small scales, a thin neck and bulky body, rough-keeled scales, and vertically elliptical pupils. Atop a paler background, all sport a series of variably shaped and sized spots or blotches, some ringed, some not, down the midline of their back. In some the blotches narrow to well-defined or inconspicuous crossbands near the tail. All also bear live young.

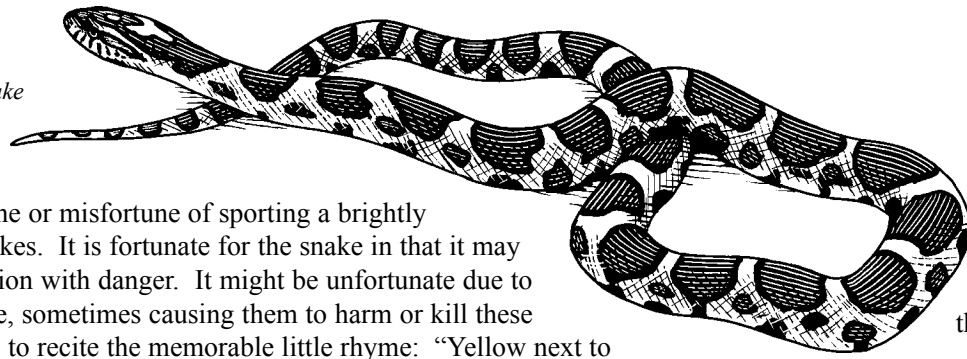
Several different types of rattlesnakes make their home within dry rocky landscapes throughout Utah. All are members of the genus *Crotalus*. They include the Mojave, *C. scutulatus*, the speckled, *C. mitchellii*, the sidewinder, *C. cerastes* and four others currently listed as subspecies of the western rattlesnake, *C. viridis* (the Great Basin, the Hopi, the prairie and the midget-faded rattlesnakes). Recent genetic evidence suggests the western rattlesnake, a very large and wide-ranging species, should actually be divided into two full species, the Pacific rattlesnake and the prairie rattlesnake. What ever they end up being named, just remember, when walking along a rocky trail, keep your ears tuned for that rattling BUZZ of a rattlesnake suggesting you stay away.



Great Basin rattlesnake



milk snake



### Milk Snake – *Lampropeltis triangulum*

Depending on your point of view, milk snakes have the fortune or misfortune of sporting a brightly colored, banded pattern similar to that of venomous coral snakes. It is fortunate for the snake in that it may afford it protection from predators that associate their coloration with danger. It might be unfortunate due to the fact that such coloration often mistakenly frightens people, sometimes causing them to harm or kill these snakes. The easiest means to differentiate between the two is to recite the memorable little rhyme: “Yellow next to black is a friend of Jack; Red next to yellow is a deadly fellow.” Lucky for the Utah milk snake, one of 25 subspecies of milk snake found in the Western Hemisphere, there are no coral snakes in Utah for which it can be mistaken.

The milk snake is a small to medium-sized snake attaining a length of about 3 feet. Strikingly beautiful, it has intense white, red and black bands decorating the full length of its body. The colored bands can be variably complete or incomplete between individuals. The Utah subspecies, *L. t. taylori* is distinct in that its snout is black, or light with a black blotch on the top and on the tip. Its skin is smooth and polished; the generic portion of its name, *Lampropeltis*, appropriately means “shiny skin.”

Even though there are no coral snakes in Utah with which to confuse the milk snake, there is another snake in Utah, the Sonoran mountain king snake, *Lampropeltis pyromelana*, which bears a pattern of white, black and red colors almost identical to that of the milk snake. The nose of the mountain king snake is usually white, not black, and the snake is more rare. Both snakes though have similar preferences in habitat and their ranges overlap.

An uncommon species in Utah, milk snakes range across the central and eastern portions of the state, from south of Salt Lake City through the southern Wasatch Mountains and central plateaus, and eastward into the Uintah Mountains and Uinta Basin near Vernal. Within their range, they occupy riparian areas, rocky hillsides, damp meadows and brushy habitats in forest and grassland ecosystems at elevations below 8,000 feet.

Milk snakes are shy, nocturnally active snakes that feed mainly on rodents such as voles, mice and rats. They also take lizards, snakes and snake eggs, plus small birds and their eggs too. When prey is captured, it is constricted before being consumed. Barns or other human habitations supporting healthy populations of rodents are favorite haunts of milk snakes. Their name, milk snake, comes from an old wives’ tale that says milk snakes suck all the milk from cows. Physically not possible, the tale may have originated from a farmer here and there spotting a milk snake hiding below a bale of hay, its belly distended, actually full of young mice, not really milk.

Perchance you’ll have the good fortune of being the beneficiary of one of these natural mice-trapping (and also beautiful) snakes near your abode.

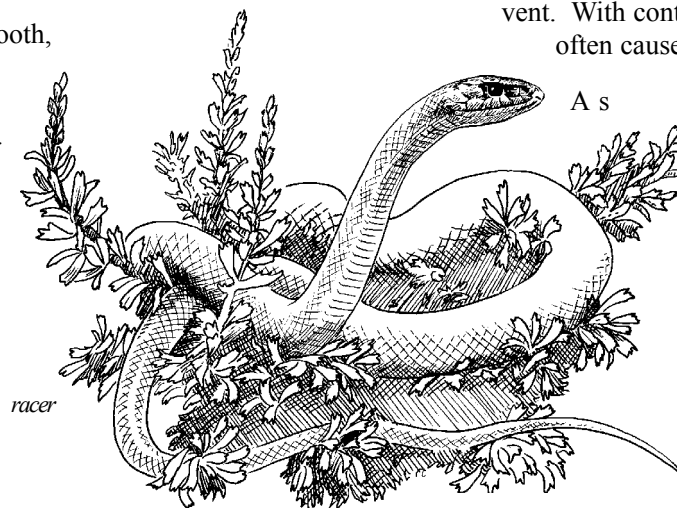
### Racer – *Coluber constrictor*

Contrary to what its scientific name suggests, the racer is not a constrictor. At most they will throw a loop of their body over their prey to hold it down, but they do not suffocate their prey before ingesting it. Foraging actively during the day, racers eat a variety of critters including lizards, snakes, small rodents, birds, amphibians and large insects.

Racers though, as their common name implies, are fast-movers. Described as “greased lightening,” they are considered one of the fastest snakes. Racers have been clocked at a speed of 3 ½ miles per hour. When hunting, they move rapidly through cover, holding their head high and alert for potential prey. Often they are seen streaking across a road.

Racers are large, slender and agile snakes that measure between 3 and 5 feet in length. Their smooth, satiny scales are a uniform bluish-brown or dark, olive-green color above, shading to a lighter color on the sides. The belly scales are white near the head end, grading to yellow towards the tail. One of the most distinguishing characteristics of racers is their large eyes with round pupils.

The subspecies of racer found in Utah, *C. c. mormon*, ranges from southern British Columbia down through the western United States. Known by a variety of common names such as the Mormon racer, the blue racer, or the western yellow-bellied racer, in Utah this subspecies is found in most areas of the state, except the West Desert and elevations above 7,000 feet. Racers prefer open areas in meadows, fields, woodlands, sparse brushy areas and streamside thickets. Primarily ground-dwelling snakes, they will readily go into water and are good climbers, sometimes being found in the tops of small trees or shrubs.



racer

As other snakes in Utah, racers hibernate during the cold winter months. After mating in the spring, females lay between 5 and 28 leathery eggs with a rough, granular texture. Eggs are laid in rotting tree stumps, under rocks or in small mammal tunnels. Sometimes a number of females lay their eggs in a communal nest. Hatching in about 6 to 9 weeks, the young racers measure 8 to 13 inches long. Marked with brown spots and irregular gray, brown or reddish blotches on a yellowish background, they look completely different than the adults except for their large eyes.

Racers will usually attempt to make a speedy escape when confronted. If escape is not possible, they will often vibrate their tail. In leaves this produces a sound resembling that of a rattlesnake’s rattle. If high velocity and bluff are unsuccessful at deterring danger, racers resort to outright aggression. With as much fury as a wild cat, a restrained, irritated racer (moderately well-equipped with teeth) will thrash back and forth and bite repeatedly, leaving a number of painful scratches on the person foolish enough to grab one. As a suggestion, you might consider refraining from being a daredevil when a racer is in your midst. Instead maybe just watch it as it races away as fast as it can.

### Ringneck Snake – *Diadophis punctalis*

Ringneck snakes are widespread, occurring throughout much of the United States, southeastern Canada and most of Mexico. In the Southwest, they are relatively common, except in the dry, western deserts. In Utah, populations of ringneck snakes occur throughout the central mountain ranges from the south-central plateaus to the north end of the state. Some populations have also been found in a few ranges of the Great Basin.

Preferring moist areas near water, ringneck snakes are most common in small canyons where permanent water is available and slopes face south or west. In Utah, they inhabit oak and juniper forests as well as low growing shrub and riparian habitats at elevations below 7,000 feet.

Twelve subspecies of ringneck snake are recognized across the continent. All are shaded a solid, blue-gray to greenish-gray or olive above. Below, however, they are a bright buttery-yellow to orange-red color, reaching extremes of brilliant salmon or reddish-pink towards the tail, particularly in western subspecies. Variably configured black spots dotting their colorful undersides can be used to distinguish between subspecies. The subspecies found in Utah is known as the regal ringneck snake, *D. p. regalis*.

In addition, as their name tells, ringneck snakes have a neck encircled by a band, usually a bright yellow or orange colored band that matches their underside. There are always exceptions to any rule though and in most populations of the subspecies found in Utah, the band around the neck happens to be missing. A slender snake, the ringneck snake has a flattened head and a long tapered tail. They measure about 12 to 30 inches in length and have very smooth scales that give them a glistening reflective sheen. Newly hatched snakes have the same coloration and markings as the adults.

A peculiar behavior common to all ringneck snakes is their response to danger. When alarmed, the snake hides its head and coils its tail into a tight spiral, flashing the bright underside. The intent of this dramatic display is to startle or distract a potential foe. Predators include owls, other snakes such as racers, skunks, and other carnivores. If further harassment is incurred, the ringneck employs its next defense—it exudes a very pungent, nasty-smelling musk from its vent. With continued provocation, western subspecies go one step beyond. They flip over and feign death, a ploy that often causes predators to loose interest giving them a chance to escape.

As one would guess from their preference for moist habitats, ringneck snakes prey on other animals associated with water, including frogs, salamanders, worms and slugs. In addition to this rather slimy fare, they also dine upon lizards and small snakes. Ringneck snakes partially constrict their prey. Some western subspecies also show evidence of a primitive venom apparatus consisting of enlarged rear teeth and chemicals in their saliva thought to have a paralytic effect on their prey.

Very secretive and shy, ringneck snakes move about under the darkness of night. During the day they hide underneath the bark of fallen trees, under flat rocks or below other debris. Unfortunately because of this nature, people seldom get a chance to see them, or their stunning display.



ringneck snake

## Gopher Snake – *Pituophis catenifer*

Gopher snakes are among the “Tony-winning” actors of the snake world. Not only do they resemble rattlesnakes, when harassed, a gopher snake will coil up, flatten its head, hiss, vibrate its tail and strike like the real thing. In dry grass or leaves the vibrating tail creates a sound just like the rattling generated by the rattle at the end of a rattlesnake’s tail. The loud hiss is a result of air being expelled past a unique cartilaginous filament in front of the snake’s glottis. Although a good tactic to ward off predators, this act also gets many gopher snakes killed by people fearing they are rattlesnakes – unfortunate cases of mistaken identity.

Described in some references as the largest snake in temperate North America, the subspecies of gopher snake found in Utah reaches lengths in excess of 5 or 6 feet. A relatively robust-bodied, muscular snake, its back is trimmed with brownish-black to reddish-brown saddle-shaped blotches atop a straw or creamy yellow-colored background. The dark pattern contrasts more around the head and tail regions, smaller, lighter blotches stretch down the sides, and the underside is a pale yellow color. A prominent dark stripe also bridges the top of the head, reaching from eye to eye and down along the angle of the jaw. Each of the scales covering their back has a small ridge or keel that makes gopher snakes feel a little rough to the touch. Unlike rattlesnakes, gopher snakes have a small, oval-shaped head that is only slightly distinguishable from its neck, and the pupils of their eyes are distinctly round, versus elliptical.

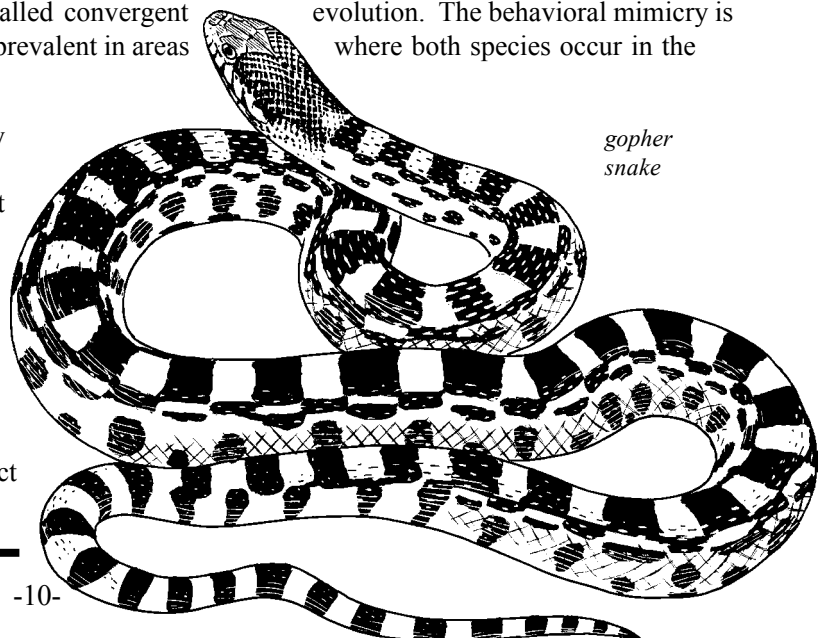
Gopher snakes and bull snakes (as they are commonly called in the Midwest) are a wide-ranging species. Some taxonomists group them together into one species along with a similar, related species, the pine snake, *Pituophis melanoleucus* of the eastern United States. The generic name for both species comes from the Greek words *pity*, meaning pine and *ophis*, meaning serpent. *Catenifer* comes from the Latin words *catena*, meaning a chain and *fer*, meaning to bear, in reference to the chain-like pattern covering their back.

A habitat generalist, in the Southwest gopher snakes live from low deserts up into montane forests around 9,000 feet in elevation. The subspecies living in Utah, the Great Basin gopher snake (*P. c. deserticola*) is found throughout the state, except in the highest mountains. It occupies a wide variety of habitats: grasslands, coniferous and deciduous forests, riparian areas, desert scrublands, sagebrush rangelands, pinyon-juniper woodlands and agricultural lands.

Active during the day, except in extremely hot conditions, slow-moving gopher snakes investigate burrows, rocky crevices and climb trees in search of prey. Adults hunt small rodents, young rabbits, lizards, birds, sometimes their eggs, and occasionally, other snakes. Nonvenomous, they subdue their prey by constriction. Though predators themselves, gopher snakes may become prey to hawks, owls, foxes, coyotes and other predators. When threatened, they initiate their belligerent rattlesnake-like spectacle. This behavior and superficial resemblance to rattlesnakes has inspired some tall tales about these snakes. One tells of a cross-breed snake, a vicious “bull rattler,” capable of inflicting a deadly bite with fangs or squeezing its victim to death.

Pure fable, in reality, these two distinct snakes cannot interbreed. Their similarities, though, have long served science as an example of Batesian Mimicry, in which a harmless “mimic” avoids predation on behalf of its resemblance to a venomous “model.” A more recent theory suggests both snakes evolved independently to blend in well with their environment (cryptic coloration) through a process called convergent evolution. The behavioral mimicry is where both species occur in the same habitat.

In the breeding season, male gopher snakes vigorously defend breeding territories. During combat “dances,” head-rearing, hissing, intertwining male snakes battle it out like intense Grecian wrestlers, sometimes for even up to an hour. Six weeks after mating, females lay a clutch of 2 to 20 eggs. Hatchlings emerge fully developed within 10 weeks and are large enough to eat small mice. In winter they retreat to communal dens they sometimes share with rattlesnakes, whipsnakes or racers. When you next see a gopher snake, don’t run away. Just remember their act is a big bluff and enjoy the play.





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## Garter Snakes – *Thamnophis* spp.



If you see a snake swimming in a stream or pond, it's most likely a garter snake. Found as far north as the Territories, coast to coast through the United States, and down through garter snakes are the most common of all North American snakes.

Canadian Northwest  
Texas and the Gulf of Mexico,

Garter snakes are medium in size, measuring about 2 to 3 feet in length. They are long and slender and have a distinct neck. In general, they have dark colored bodies of brown, olive or gray variably highlighted by three light yellowish or orange stripes, sometimes bright, sometimes more faded, running the length of the body, and sometimes accented by spots along the sides. The ground color between the stripes may be solid or broken into bars or checkered blocks. The variations on the basic theme seem endless and have for years been a source of torment for taxonomists. Many subspecies have been defined, but even within subspecies, there is color variability.

Garter snakes have been given their common name because the longitudinal stripes and patterns on their sides resemble those of the garters once worn by men to hold up their socks. This coloration allows garter snakes to blend well into their surroundings making them less visible as they secretively slither through the vegetation. *Thamnophis*, their genus name, means "bush snake" in Latin.

Also found in the widest variety of habitats garter snakes are semi-aquatic and usually stay relatively close to permanent sources of water. They commonly reside along the edges of streams, near sloughs and around marshy ponds. Found often in gardens, people sometimes mistakenly call them garden snakes. Active during the day and night, when hunting they flick their red, black-tipped tongue in search of frogs, toads, earthworms, slugs and small fish upon which to feed. Quite opportunistic when it comes to diet, they sometimes eat insects, spiders, small mammals and small birds as well.

Garter snakes are able to tolerate colder temperatures and in the more southerly portions of their range, they may be active all year. In the northern portions of their range, they hibernate in communal dens, sometimes together in great numbers. Reproduction endeavors begin in spring when males and females emerge from their winter dens. Males, the first to exit, stay nearby and wait for the females to emerge. They are able to sense the readiness of a female to mate by chemical changes in secretions of her skin. The male entices the female by rubbing his chin along her body. Eventually he aligns his body next to hers and wraps his tail around hers. After breeding is completed, the male inserts a copulatory plug inside the female that physically prevents other males from mating with her. The plug also contains a chemical message that informs other males she is not receptive to their advances. Garter snakes give birth to live young. Most give birth to 20 or so young, although one litter of 98 young was recorded.

Garter snakes are relatively harmless. When handled, they rarely bite, and if they do, only a mild redness or swelling may occur. When captured, instead of biting, garter snakes employ an even more effective deterrent. They release a profoundly foul-smelling musk from their vent. After contact with this pungent liquid, most predators (and people) steer clear of garter snakes.

Three species of garter snakes inhabit Utah, the common garter snake, *T. sirtalis*, the western terrestrial garter snake, *T. elegans*, and the black-necked garter snake, *T. cryptopsis*. Not the most common of the three garter snakes in Utah, as one might guess, the common garter snake occurs primarily in the northern, eastern and central areas of the state, being absent from the more arid western and southern desert areas. The subspecies that occurs in the state is the valley garter snake (*T. s. fitchi*). This snake bears yellow mid-dorsal and lateral stripes. Red spots surrounded by black decorate the space between the stripes.

The subspecies of western terrestrial garter snake found in Utah (*T. e. vagrans*) is known as the wandering garter snake. Stripes on this species are more narrow and dull with a washed out appearance. Wandering garter snakes range statewide. The third subspecies, the western black-necked garter snake (*T. c. cryptopsis*) can be most readily distinguished by the two large, black blotches located on the nape. The range of this species extends south into northern Mexico but in Utah covers only the southeastern part of the state. A good field guide elaborating more on specific markings, variations and distribution will help to determine which is which. Or you can just say you saw a garter snake and leave it at that.

## Snake or Serpent? Friend or Fiend?

*"But never met this fellow, attended or alone, without a tighter breathing and zero at the bone."*

**-- Emily Dickenson,  
The Snake**

How do you react to snakes? Are you frightened or fascinated? Snakes seem to inspire every human emotion except indifference, even in people who have never actually seen a live snake. When it comes to animals with a public image problem, snakes are near the top of the list, and the animosity faced by snakes is often fierce. People who dislike snakes hate them with an intensity they accord no other creature. Some people have such an overwhelming, irrational fear of snakes that the phobia may restrict their lifestyles. This fear, known as *ophidiophobia*, may cause people to avoid all areas where there is the slightest chance that a snake could be encountered. (*Ophidia* is Greek in origin and means serpent.) Many victims of this phobia can't even view a movie or photograph of a snake without experiencing acute anxiety, and could probably not even bear to read this publication.

So why do people react so strongly to snakes? "The mind is primed to react emotionally to the sight of snakes," writes renowned biologist, E. O. Wilson, "not just fear them but to be aroused and absorbed in their details, to weave stories about them." "Human beings," he writes, "have an innate fear of snakes, or more precisely, they have an innate propensity to learn such fear quickly and easily past the age of five."

According to Wilson, the fear of snakes is primordial and runs deep in humans as well as in primates of the Old World such as in chimpanzees, a species believed to share a common ancestor with prehumans as recently as five million years ago. "The reaction is not a hard-wired instinct," writes Wilson. "It is a bias in development of the kind psychologists call prepared learning. Children simply learn fear of snakes more easily than they remain indifferent or learn affection for snakes." This tendency to fear snakes, he says, can be magnified by scary stories and experiences in childhood. "The propensity is deep-set," he writes. "Other common fears...start to wane after seven years of age. In contrast, the tendency to avoid snakes grows stronger with time." He adds though, "It is possible to turn the mind in the opposite direction, to learn to handle snakes without apprehension or even to like them in some special way."

Why might this deep-set innate propensity to learn fear of snakes exist? "The probable ultimate cause, the survival value of the aversion is well understood," writes Wilson. "For hundreds of thousands of years, enough time for the appropriate genetic changes to occur in the brain, poisonous snakes have been a significant source of injury and death to human beings. It pays in elementary survival to be interested in snakes and to respond emotionally to their generalized image, to go beyond ordinary caution and fear. The rule built into the brain...is: become alert quickly to any object with the serpentine gestalt. *Overlearn* this particular response in order to keep safe."

Other primates have evolved similar rules. For example, when guenons or vervets see a python, cobra, or puff adder, they emit a distinctive alarm call that rouses members in the group. The monkeys, in effect, broadcast a dangerous snake-alert. Other studies show that when adult rhesus monkeys see a snake, they react with the generalized fear response of their species. Rhesus monkeys raised in the laboratory with no previous exposure to snakes showed the same fear response as wild monkeys, though weaker. The serpentine shape and distinctive movement patterns, it was shown, were the key stimuli to which the monkeys responded.

Connected to the intense emotions snakes evoke is an explanation for the powerful symbolism and cultural significance snakes have had throughout human history. In the words of Wilson, "Snakes provide an example of how agents of

nature can be translated into the symbols of culture." As in monkeys, "people also display the mixture of apprehension and morbid fascination" towards snakes. "They inherit a strong tendency to acquire the aversion during early childhood and add to it progressively. The mind then adds a great deal more than is distinctively human. It feeds upon the emotions to enrich culture." The power and mystery of the serpent thus becomes the natural ingredients of myth and religion.

This inborn awe of snakes is evidenced in the ancient and worldwide inclusion of serpents in art, religion and myth. Emblems of power and ceremony throughout history, snakes have been either revered or reviled wherever they occur. Because of their ability to shed their skins and be "reborn" again and again, they have been venerated as symbols of life, fertility and immortality. Their power to cause sickness or even kill with a single bite, has on the other hand, led them to be despised as evil spirits that bring destruction.



And for the rest of his life, the young reptile suffered deep emotional scars.

Serpentine forms wind across stone carvings from paleolithic Europe and are scratched into mammoth teeth found in Siberia. Quetzalcoatl, the mythical, “plumed serpent,” was worshipped by the ancient Aztecs of Central America as god of the morning and evening star, having power over death and resurrection. He also reigned as deity of the arts and other elements of good in life, including light, wisdom, honesty and happiness. The Mayans decorated their ancient buildings and pyramids with the diamond pattern of the rattlesnake and rattle images, and in their astronomy a snake represented the celestial equator. Some African cultures worshipped rock pythons and considered the killing of one to be a serious crime. In Australia, the Aborigines associated a giant rainbow serpent with the creation of life.

In Egypt, the goddess, Buto, a great protector of the rich delta, was frequently represented as a cobra. Also a sign of imperial power, Cleopatra is said to have taken her life by allowing a cobra to bite her. Ancient Egyptian rulers wore snake images on their crowns as well. A famous example is the cobra seen on the death mask of King Tutankhamun. In India, numerous legends built around the Nagas, a magical race of snake gods responsible for healing, were shared through time. Statues of these snakes are still worshipped in the south of India. A snake was used as the symbol of the Greek god Asclepius who was responsible for healing. According to Greek mythology, Asclepius discovered medicine by watching as one snake used herbs to bring another snake back to life. Still today, two snakes entwined around a staff form the universal emblem of the medical profession.

Many snake stories in North America originate from Native American cultures. A pictograph painted on a cave wall in Utah over 2,000 years ago depicts a medicine man performing a snake dance thought to be part of a ritual intended to ensure the fertility of crops. The Pueblo Indians likened lightening to the rattlesnake’s strike, and the thunder and hiss of rain was mimicked in its rattle. Rattlesnakes were believed to bring the rain that would enable Mother Earth to flourish and germinate. The Hopi Indians of Arizona still do a snake dance as part of a ritual ceremony to bring rain.

Judeo-Christian culture has been less kind to snakes. The identification of the serpent with Satan in the Garden of Eden has contributed to a negative image of snakes in western culture. In Appalachia, some Christians handle venomous snakes as part of ritual ceremonies, relying on faith to protect them from bites. Among Catholics, Saint Patrick is credited with charming the snakes of Ireland and driving them out of the country, a feat celebrated by many as a good thing. Declines in snake populations across the West resulting from destruction of countless snake dens by early pioneers are still evident today. And annual rattlesnake round-ups, one of the most abhorrent displays of snake persecution and cruelty, still take place in a couple of states. Modern folktales espousing myths that snakes suck milk from cows, poison people with their breath, roll like hoops and swallow their young when in danger also abound. Media sensationalism of snakes is common, and even *Webster’s* lists “a treacherous person” as one of the definitions of a snake.

It’s true that people around the world regularly die as a result of being bitten by a venomous snake. Statistics compiled by the World Health Organization indicate 30,000 to 40,000 deaths annually from snakebite. The incidence is highest in rural agricultural and pastoral populations of Southeast Asia, West Africa and parts of tropical America. In North America, the odds of dying from snakebite are in our favor. According to figures given by *Discover* magazine, your risk of dying from an earthquake or volcano is 1 in 11 million, and you have a 1 in 23 million chance of drinking a lethal dose of detergent. Your odds of dying from the bite of a native snake species in this country are 1 in 36 million.

In the United States and Canada, about 8,000 people are bitten each year, but only about 10 to 15 die. Contrary to popular belief, bites from venomous snakes in Utah are rare. The annual average has been less than six since 1900 when accurate records were kept. Only two deaths have resulted from snakebite in Utah since that date. Nationwide, the majority of people bitten by venomous snakes were playing with or attempting to molest them before being bitten. Worldwide less than a quarter of all snakes, about 800, use venom to kill their prey, and only 400 can deliver a poisonous bite to a human. Of the 115 species of snakes in the United States, only 20 are venomous.



“Well, I’m not sure. ...I guess it’s been washed.”

Despite how genetically entrenched and/or culturally influenced our feelings about snakes may be, it’s important to judge them upon facts, not prejudice and ignorance. It is important we recognize snakes as an essential and integral part of ecosystems. Snakes consume countless numbers of potentially destructive mice, rats and other rodents each year as farmers can attest. They are also an important prey base for many predatory animals such as golden eagles, red-tailed hawks and coyotes. Most of all, they are important simply because they represent a form of life on Earth — another strand in the intricate and fascinating web of life.



**Objectives:** Students will be able to: 1) Explain why and how snakes use their forked tongues to learn about their environment; 2) Experience how a snake uses its tongue as a sensory organ to follow a chemical signal.

**Overview:** Students pick up and differentiate between different flavored jelly beans as a snake would use its tongue to pick up and analyze chemical odor molecules from its surroundings to learn about its environment.

**Background:** Why do snakes stick out their tongues? Although snakes possess an array of sense organs, including eyes, inner ears, and nostrils, these particular senses are not especially well developed. Snakes though can gain a good deal of information from their environment with their forked tongue. The tongue of a snake isn't used for tasting though as tongues usually are. Instead it's used to "smell" the air and ground. Snakes use their tongue to pick up tiny odor molecules, or chemical signals, and transfer them to a highly sensitive chemical receptor, the Jacobson's organ, located in the roof of their mouth. This organ analyzes chemical signals and allows snakes, among other things, to track prey, recognize predators, find mates or locate their dens.

**Materials:** 5 or more different flavors of jelly beans (either pick flavors that are very distinct or less distinct from each other depending on how challenging you want to make the activity); chalk (on asphalt) or masking tape (on floor inside) to lay out trails students will follow; brown paper bags (the bags are to hide the color of the jelly beans so students use taste and not color to tell them apart); sets of cards marked with: mouse, wintering den, mate, or predator-safe zone (one different card for each student).

## Procedure:

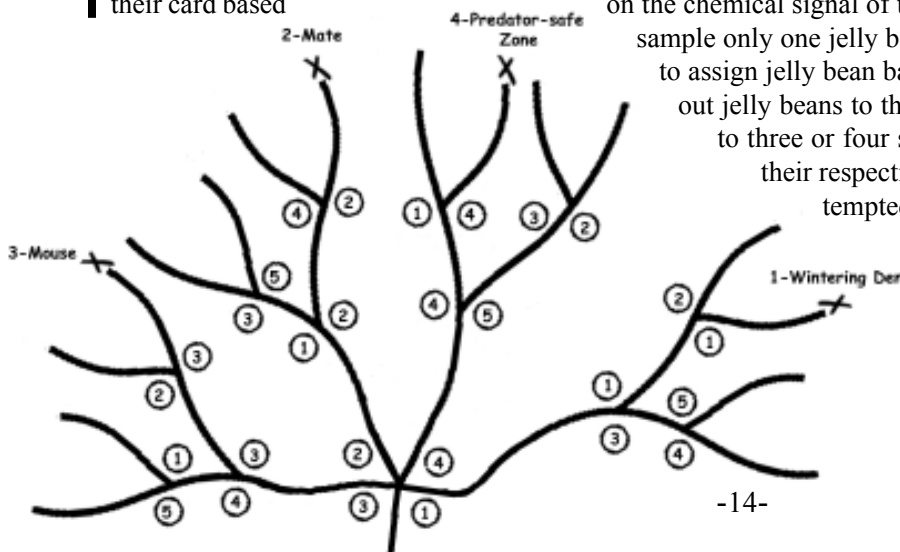
1) Ahead of time, lay out a trail system in a large playing area (see diagram below). Assign one flavor of jelly bean to each of the four things on the cards. Place bags containing one flavor of jelly bean at each of the forks in the trail as shown (you may have to number the bags on the bottom in a hidden spot to keep track). Arrange flavors that only one path will be correct for the one thing listed on each card. At forks in the trail, students will have to choose which path to take depending on the taste of the jelly beans in each bag. The first "fork" will have to be a junction of four paths. To simplify the activity for younger students you might use only two or three flavors of jelly beans and only one desired destination, such as to the mouse.

2) Briefly discuss the different senses snakes possess and how snakes use their tongues to pick up odor particles to learn about their environment. Tell students they will use their tongues like snakes do to learn about their environment. Since they can't pick up odor particles like snakes can, tell them they will be picking up jelly beans and tasting them instead.

3) Tell them that each flavor of jelly bean corresponds to something listed on a card they will get. Share the four things on the cards and let each student pre-taste a jelly bean that corresponds to each thing on the cards so they can learn the particular "chemical signals."

4) Pass out one card to each student at random. Ask them not to let others know which card they have. Tell them they will be trying to find what is written on their card by following the correct "chemical signal" trail.

5) Have students approach the trail system. Tell them they are to choose the correct path to what is written on their card based



on the chemical signal of the jelly beans at each fork. Tell them to sample only one jelly bean from each bag as they go. You may want to assign jelly bean bag monitors at the forks in the path to dole out jelly beans to the students. To save time, you can have one to three or four students go at one time. Have them stay at their respective destination until all students have attempted to follow their particular chemical trail.

6) When all students have followed what they believe to be the correct path, reveal where each path leads. Then, have the students share what's on their card and see if they ended up where they were supposed to.

## Resources

## Sensational Snake Stuff!

Call Project WILD at (801) 538-4719  
or e-mail [dianavos@utah.gov](mailto:dianavos@utah.gov)

### Snake Resources:

**Great Basin Rattlesnake Poster** - Dynamic, full-size poster featuring this rattlesnake found in Utah.

**Snakes Alive!** - Great poster showing various North American snakes from the U.S. Forest Service.

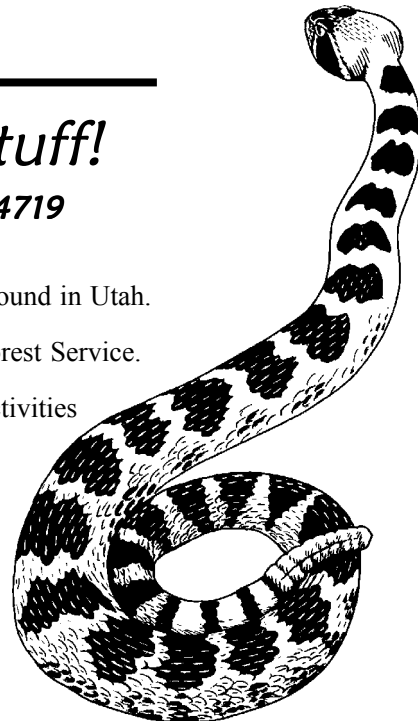
**"Skin the Snake" & "Snake in the Grass"** - Two excellent fun and physical snake activities to do with students from *The New Games Book*, Headlands Press, 1976.

**"See the Heat"** - Fun activity developed by Utah Project WILD to let kids experience how pit vipers use the heat-sensing pits on their face to "visualize" radiant heat.

**Snakes & Rattlesnakes** - Two educational magazines in the "Zoobooks" series. Send check made out to UDWR for \$2 each to Project WILD, PO Box 146301, Salt Lake City, UT 84114-6301.

**Utah's Reptiles and Amphibians** - Booklet with information about a variety of Utah's herptiles, including snakes.

**Reptiles and Amphibians** - New Project WILD wildlife education resource materials kit featuring snakes, other reptiles and amphibians. Soon available for checkout. (Note: If you have not been making use of the materials Project WILD has available for check-out because you are unable to pick items up or return them, please call to discuss possible delivery options.)



*Mojave Rattlesnake*

### Other Resources:

**Utah Prairie Dog & Mountain Goat** - Two new Division of Wildlife Resources posters featuring excellent photographs of these two species.

**Common Merganser: Bringing Back the Birds** - Beautiful poster commemorating the North American Waterfowl Management Plan, produced by the US Fish and Wildlife Service.

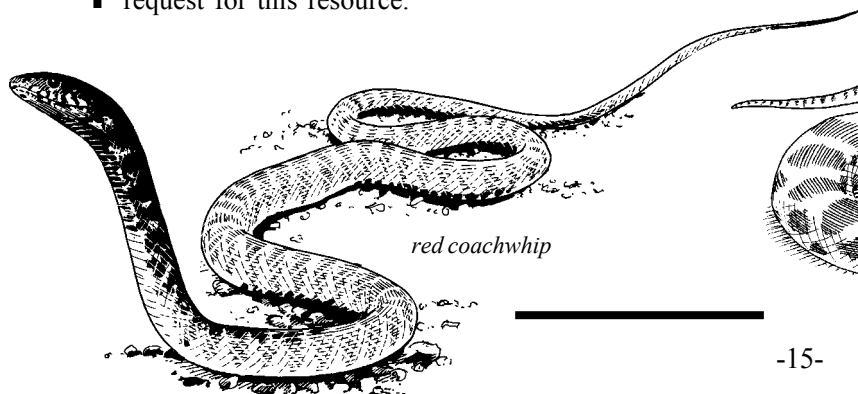
**Celebrating Special Places for Birds** - Great artwork showing an array of migratory birds decorates this nice International Migratory Bird Day-2002 poster. Educational information about bird conservation efforts is included on the reverse side.

**Columbian Sharp-tailed Grouse** - Latest in the Division of Wildlife Resources' Wildlife Notebook Series. Complete series also available online at [www.wildlife.utah.gov/publications/notebook.html](http://www.wildlife.utah.gov/publications/notebook.html).

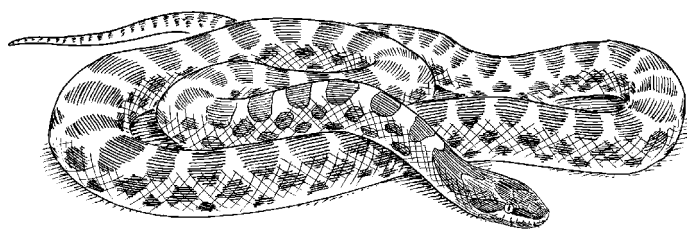
**"Energy: Fuel for Thought" & "Set in Stone: Fossils Portals to the Past"** - Two publications, each including an informative article, student activities and a colorful poster, produced by the Bureau of Land Management.

**Project WILD Resource Materials** - A newly developed comprehensive list of wildlife conservation literature for students and educator activity guides, organized by subjects, is now available. An updated and re-organized Video List is available as well.

**Project WILD Correlation of Activities to the New Science Core** - Please specify grade level when making a request for this resource.



*red coachwhip*



*night snake*

# On the National Level

## Evaluation of Project WILD: A Summary of Research Findings

### Nineteen Years of Project WILD Evaluation

Since 1983, at least 30 studies (8 national, 22 state) have evaluated Project WILD activities and materials. Educators consistently give Project WILD the highest marks for:

- Excellence
  - Educational value
  - Overall quality
  - Usefulness
- Effectiveness in meeting educational goals
  - Connections of activities to the curriculum
  - Easy adaptation



The additional articles below highlight some of the most recent findings regarding Project WILD.

### New Evaluation Instrument

The most recent evaluation, by Joe Heimlich, Ph.D. of Ohio State University (2002), concerned the development and pilot test of an evaluation instrument to be utilized by state coordinators and facilitators.

A panel of Project WILD state coordinators gathered questions for which answers about Project WILD are desired from a variety of sources. The Guiding Questions developed by coordinators were reviewed, survey instrument items were prepared, the instrument was reviewed, states were identified for testing, and the instrument was pilot tested by 231 educators in seven states.

The scale was found to consistently measure the larger construct of teacher satisfaction, including the value in training and professional development through Project WILD, benefits of Project WILD to students, and correlations to state and national standards and district curriculum.

Based on educators’ responses, a final evaluation instrument was developed. The instrument has been made available to all Project WILD state coordinators for use in their states.

### Pilot Test of Latest Project WILD Evaluation Instrument

The evaluation instrument developed (see above) was pilot tested by 231 educators in seven states.

During the course of the pilot test, not only was information about the survey instrument gathered, but information about educator satisfaction with Project WILD was collected.

During the pilot study, researchers identified the following:

- Educators use activities and supplemental materials from training that are not part of the activities conducted during the training
- Activities are used by educators as part of existing lessons or thematic units.

Educators involved in the pilot study believe that Project WILD helps students:

- Understand environmental issues
- See many sides to environmental issues
- Learn conservation and environmental behaviors

Educators clearly perceive value in Project WILD related to student learning.

Project WILD materials, coupled with training, are considered to be:

- Effective
- Easy to implement
- Easy to adapt

Educators use Project WILD because they believe in its value.

*“This program helps us meet the needs of every learner in our classroom with the added bonuses of increasing awareness and relating science to everyday life.”*

-Teacher comment

#### Project WILD Educator Survey

The Project WILD Educator Survey can be found on the Utah Project WILD website at [www.wildlife.utah.gov/projectwild](http://www.wildlife.utah.gov/projectwild). If you wish to contribute to the data on use of Project WILD in Utah please download, complete and submit the survey. Your input will be greatly appreciated.

### Evaluation of Learner Knowledge & Attitude Gains (2000-2001)

A group from Ohio State University developed a highly controlled study to measure the impact of Project WILD on student learning and attitudes.

Because Project WILD is a complex collection of activities and units, one unit from the “framework” was selected and isolated. Teachers involved in the study conducted five activities from the unit (from a choice of nine) and student knowledge was measured specifically on knowledge outcomes identified in the framework, and not on knowledge specific to each activity.

Using a pre- and post-test, treatment and control group design, this study was utilized in eight classrooms (n=224). The study confirmed that:

1. *Project WILD has a positive impact on student knowledge about wildlife; and*
2. *Exposure to Project WILD activities has a positive impact on the attitudes of students toward wildlife and constructs about wildlife.*

Mean scores for students participating in Project WILD activities were higher for both knowledge and attitude than were those who did not participate. Standard deviations also reveal there is consistency in the response patterns for students who participated.

The use of five activities from the one unit of the Project WILD K-12 Curriculum Guide resulted in nearly a 10% score increase on a difficult test based on the framework.

Control measures and statistical data reveal that outcome gains (learning) by students in the treatment group can be attributed directly to their participation in Project WILD.

### Educator Feedback on Project WILD (1998-2000)

Randi Korn and Associates, Inc. completed a multi-phase evaluation of Project WILD from 1998-2000. The work by Korn and Associates included surveying, observing and interviewing students and teachers to determine how Project WILD is utilized in classrooms and non-formal settings.

Educators nationwide gave highest marks to Project WILD for its educational value, level of involvement by students, and overall quality. Ease of use, capacity for modification to meet student needs, and ability to connect the activities to their curriculum were also motivating factors for using the program with students (each of these criteria had a mean rating of 6 on a 7-point scale).

The following feedback was received from educators for the 1998-1999 school year:

- Educators who used Project WILD each reached an average of 88 students.
- Sixty percent of trained educators use Project WILD more than four times per year.
- Non-classroom educators were most likely to use Project WILD seven or more times per year; classroom educators tended to used Project WILD four to six times per year.
- Seventy percent of educators selected specific activities for their students because the content corresponded with the curricula. Eighty-three percent of these educators connected Project WILD with their science curriculum.
- The activity type most frequently used was animal/nature observations (59%), followed by physically challenging games (47%) and writing/reading/discussion activities (34%)
- Seventy-two percent of educators now using Project WILD have been using the program for three or more years.
- Sixty percent of educators surveyed do not use any other wildlife programs.
- The majority of educators became involved in Project WILD for professional development (53%) or because they believed in the values and ideology of the program (51%).

Randi Korn and Associates, Inc. reviewed 452 questionnaires from randomly selected educators trained in Project WILD throughout the U.S., and completed telephone interviews with 18 former users of the program.

Based on the evaluation done by Korn and Associates, the **Project WILD K-12** and **Aquatic Curriculum and Activity Guides** were revised in 2000. The conceptual framework was updated, a Learning Framework was developed, new activities were developed to eliminate conceptual gaps, and subject area standards were developed.



## Advanced Wildlife Workshop

Join Project WILD and the Wild Turkey Federation for an exciting wildlife education workshop featuring the wonderful wild turkey.

During this workshop, participants will:

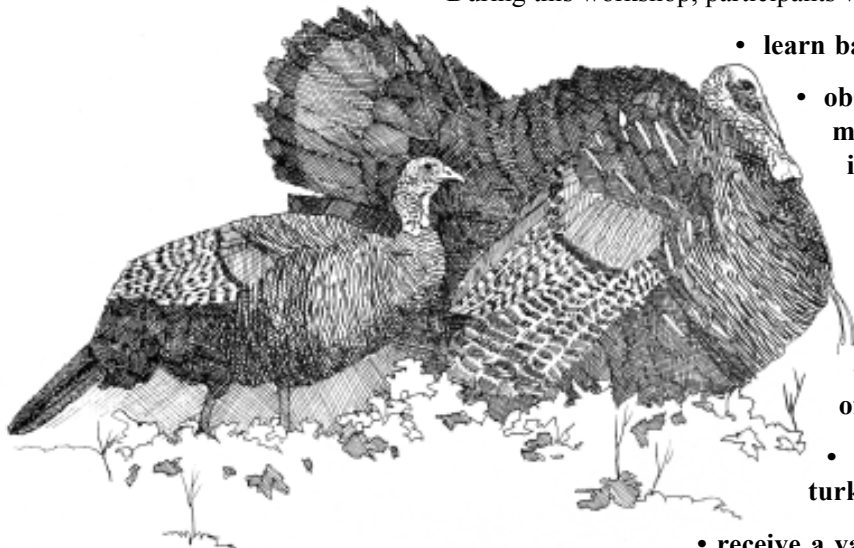
## WILD About Wild Turkeys

April 25-26, 2003

Zion National Park

Registration Deadline

February 20, 2003



- learn basics of wild turkey natural history and ecology;
- observe wild turkeys in the wild during their spring mating season, and experience the thrill of calling in a gobbler and witnessing his elaborate spring dance;
- explore population and habitat management techniques with a Division of Wildlife Resources biologist;
- learn about the interesting cultural significance of wild turkeys throughout history;
- experience a number of excellent and fun wild turkey education activities;

• receive a variety of wild turkey education materials for use with students, including a National Wild Turkey Federation Turkey box with lesson plans, a bulletin board, fact sheets, a poster, CD-ROM and video, plus more!

The workshop will begin in Springdale, just outside Zion National Park, Utah where we will be lodging. The afternoon session will be followed with a fine dinner of turkey (wild if we are lucky) and an evening of engaging wild turkey activities. The next morning will begin with a very early rise to view wild turkeys in the field. Activities scheduled for later in the morning include overview of classroom activities and resources within the wild turkey education boxes, and discussion on means to integrate the interdisciplinary activities into your classroom and opportunities for getting students involved in wild turkey conservation and management endeavors.

Workshop Fee - \$35.00 (Note: A substantial portion of the workshop costs are being covered by a grant from the Utah Chapter and the National Wild Turkey Federation). Cancellations received after February 20, 2003 may be subject to forfeiture of the workshop fee.

USU graduate credit or state inservice/recertification credit will be available.

Tentative Times: Start - Early afternoon of April 25; End - Mid-afternoon, April 26.

Mail registration and fee before **February 20, 2003** to Project WILD, Utah Division of Wildlife Resources, P.O. Box 146301, Salt Lake City, UT 84114-6301. Space is limited so send in your registration now to secure a spot. Don't be a turkey and miss out! Questions: Call Diana Vos at (801) 538-4719 or e-mail [dianavos@utah.gov](mailto:dianavos@utah.gov).

**Return form with \$35 check payable to UDWR**

Name \_\_\_\_\_ Phone (\_\_\_\_) (\_\_\_\_)  
(h) (w)

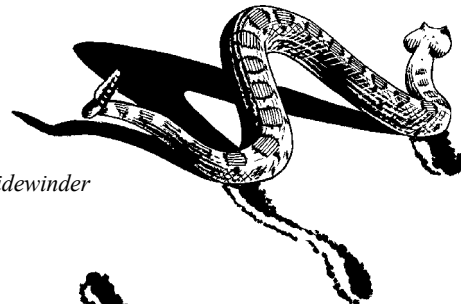
Address \_\_\_\_\_  
City State Zip

E-mail address \_\_\_\_\_ Grade(s) you teach \_\_\_\_\_

Project WILD Workshop taken when? \_\_\_\_\_ and where? \_\_\_\_\_

## What's New with Utah Project WILD?

sidewinder



**Project WILD goes "Electronic"** As paper and printing costs soar ever upwards, Utah Project WILD has begun to make moves toward the electronic realm. To reduce the paper stream, one new change will be to offer a CD ROM with PDF versions of the majority of the Project WILD supplementary materials distributed at workshops. Another change will be to start distributing the *Growing WILD* newsletter via the Internet. To initiate this process we ask that you **please provide us your e-mail address (please complete and return below by January 16, 2003)**. When future editions of the newsletter are published, you notified through e-mail, and a link to a website where you can access the newsletter will be addition to notification about subsequent newsletters, by providing us your e-mail address we to send you updates about Advanced Project WILD workshops and other events on a more timely

the form

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basis.

**One-Day Watchable Wildlife Events for Project WILD Educators** - Often educators would like to participate in wildlife-related events, but cannot spare as much time as is needed when attending events such as the more extended Advanced Project WILD workshops. So starting in 2003, Project WILD plans to team up with the Division of Wildlife Resources' Watchable Wildlife Program to offer a series of one-day wildlife viewing events. Notification about these events will, as with the newsletter, be provided to you through e-mail. Possible events will include bald eagle, osprey, burrowing owl, mountain goat, and bighorn sheep viewing opportunities. At each event a UDWR biologist will provide natural history information about the species. In addition, educational activities and resource will be shared. For most events, participants will be responsible for their individual travel and meal arrangements.

**NatureScaping Grants Now \$500** - Information and applications for the 2003 NatureScaping Grants are currently available online at the Project WILD website - [www.wildlife.utah.gov/projectwild](http://www.wildlife.utah.gov/projectwild). This year's deadline for submitting grant applications is **January 16, 2003**. Don't miss out on this opportunity to get funding towards a wildlife habitat project on or near your school grounds.

**Federal Junior Duck Stamp Conservation and Design Program Takes Wing Again** - The Junior Duck Stamp Conservation and Design Program, a program designed to instill in America's youth an appreciation for waterfowl and wetlands conservation, will again be sponsored by the Division of Wildlife's Project WILD program. More than an art contest, the Junior Duck Stamp Program incorporates a dynamic, integrated art and science curriculum to teach wetlands and waterfowl conservation to K-12 students nationwide. Contact Project WILD to request a free Duck Stamp curriculum. To learn more about the program visit the duck stamp website - [duckstamps.fws.gov](http://duckstamps.fws.gov). For a contest application form, select "2003 Jr. Duck Stamp Contest Regulations," or contact Project WILD. The contest deadline will be **March 15, 2003**.

Please Provide us your E-mail Address

**Return To: Project WILD, PO Box 146301, Salt Lake City, UT 84114-6301 by January 16, 2003.**  
**Or you can e-mail all the same information below to: [dianavos@utah.gov](mailto:dianavos@utah.gov).**

Name and Mailing Address (as printed on back page of newsletter): \_\_\_\_\_

\_\_\_\_\_ City State Zip

E-Mail: \_\_\_\_\_ Phone: \_\_\_\_\_

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address. See details on page 19.

Thanks Much!